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Fig. 1

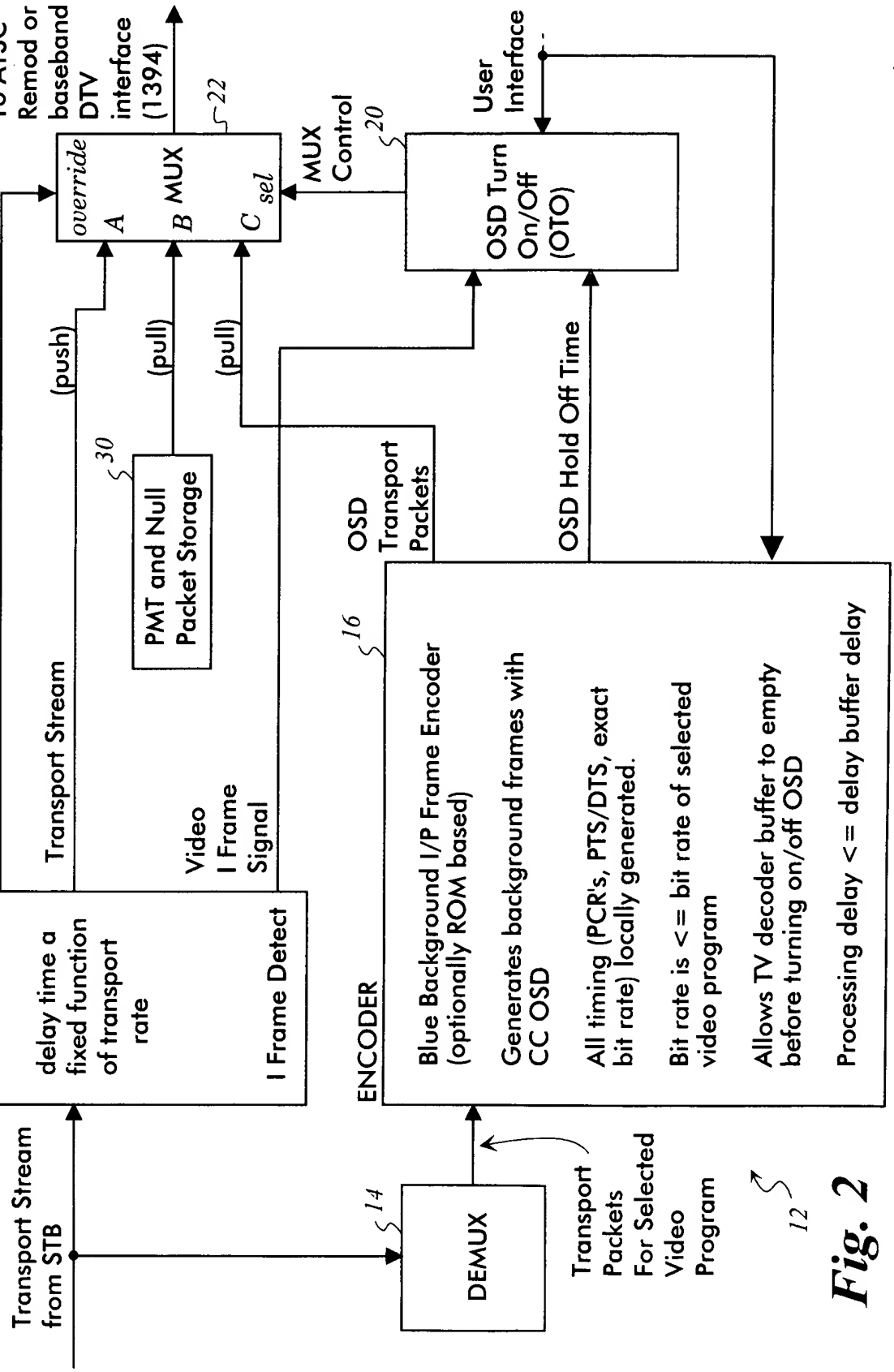
To ATSC Remod or baseband DTV interface (1394)
22
override
A
B MUX
C sel
MUX Control
20
User Interface
OSD Turn On/Off (OTO)
OSD Hold Off Time
OSD Transport Packets
30
PMT and Null Packet Storage
(push)
(pull)
(pull)
If not tx pkt for selected video, force switch to A
Transport Stream
Video I Frame Signal
18
DELAY BUFFER
delay time a fixed function of transport rate
I Frame Detect
16
ENCODER
Blue Background I/P Frame Encoder (optionally ROM based)
Generates background frames with CC OSD
All timing (PCR's, PTS/DTS, exact bit rate) locally generated.
Bit rate is <= bit rate of selected video program
Allows TV decoder buffer to empty before turning on/off OSD
Processing delay <= delay buffer delay
Transport Stream from STB
14
DEMUX
Transport Packets For Selected Video Program
12

Fig. 2

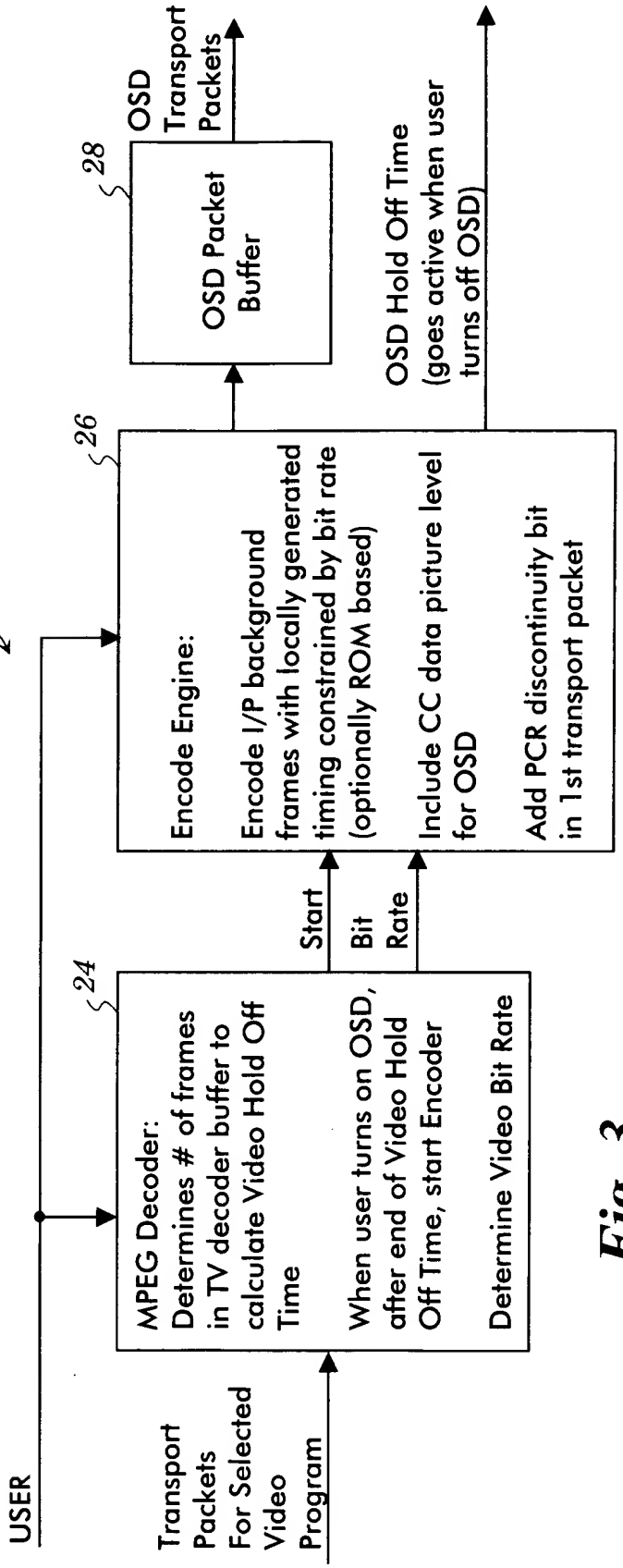
16
USER
Transport Packets For Selected Video Program
24
MPEG Decoder:
Determines # of frames in TV decoder buffer to calculate Video Hold Off Time
When user turns on OSD, after end of Video Hold Off Time, start Encoder
Determine Video Bit Rate
Start
Bit Rate
26
Encode Engine:
Encode I/P background frames with locally generated timing constrained by bit rate (optionally ROM based)
Include CC data picture level for OSD
Add PCR discontinuity bit in 1st transport packet
OSD Hold Off Time (goes active when user turns off OSD)
28
OSD Packet Buffer
OSD Transport Packets

Fig. 3

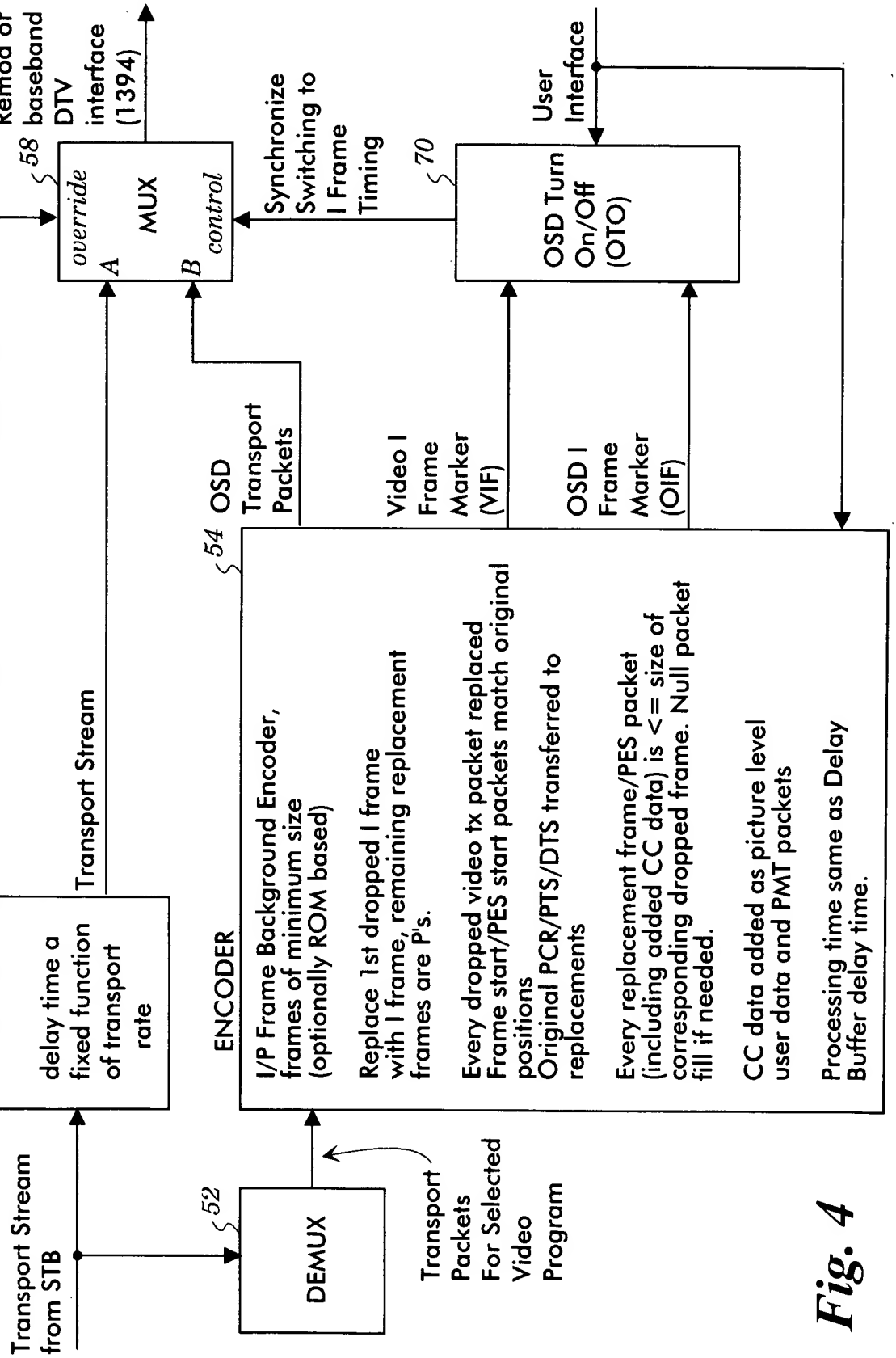
50
To ATSC Remod or baseband DTV interface (1394)
58
override
A
MUX
B
control
Synchronize Switching to I Frame Timing
70
User Interface
OSD Turn On/Off (OTO)
If not tx pkt for selected video, force switch to A
Transport Stream
56
DELAY BUFFER
delay time a fixed function of transport rate
OSD Transport Packets
54
Video I Frame Marker (VIF)
OSD I Frame Marker (OIF)
ENCODER
I/P Frame Background Encoder, frames of minimum size (optionally ROM based)
Replace 1st dropped I frame with I frame, remaining replacement frames are P's.
Every dropped video tx packet replaced
Frame start/PES start packets match original positions
Original PCR/PTS/DTS transferred to replacements
Every replacement frame/PES packet (including added CC data) is <= size of corresponding dropped frame. Null packet fill if needed.
CC data added as picture level user data and PMT packets
Processing time same as Delay Buffer delay time.
Transport Stream from STB
52
DEMUX
Transport Packets For Selected Video Program

Fig. 4

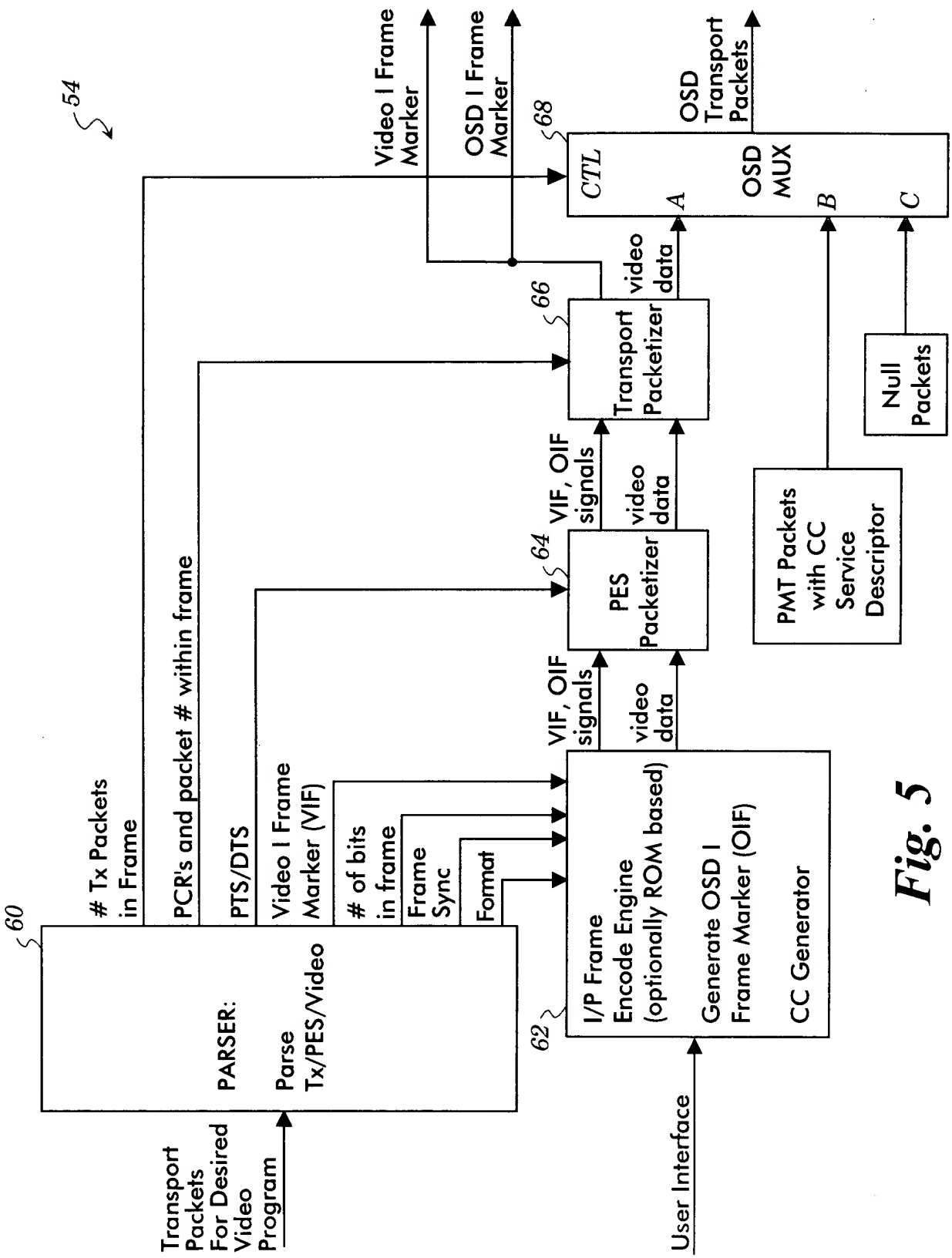
54
60
PARSER:
Parse Tx/PES/Video
Tx Packets in Frame
PCR's and packet # within frame
PTS/DTS
Video I Frame Marker (VIF)
# of bits in frame
Frame Sync
Format
Transport Packets For Desired Video Program
62
I/P Frame Encode Engine (optionally ROM based)
Generate OSD I Frame Marker (OIF)
CC Generator
User Interface
VIF, OIF signals
video data
64
PES Packetizer
VIF, OIF signals
video data
66
Transport Packetizer
video data
Video I Frame Marker
OSD I Frame Marker
68
CTL
A
OSD MUX
B
C
OSD Transport Packets
PMT Packets with CC Service Descriptor
Null Packets

Fig. 5

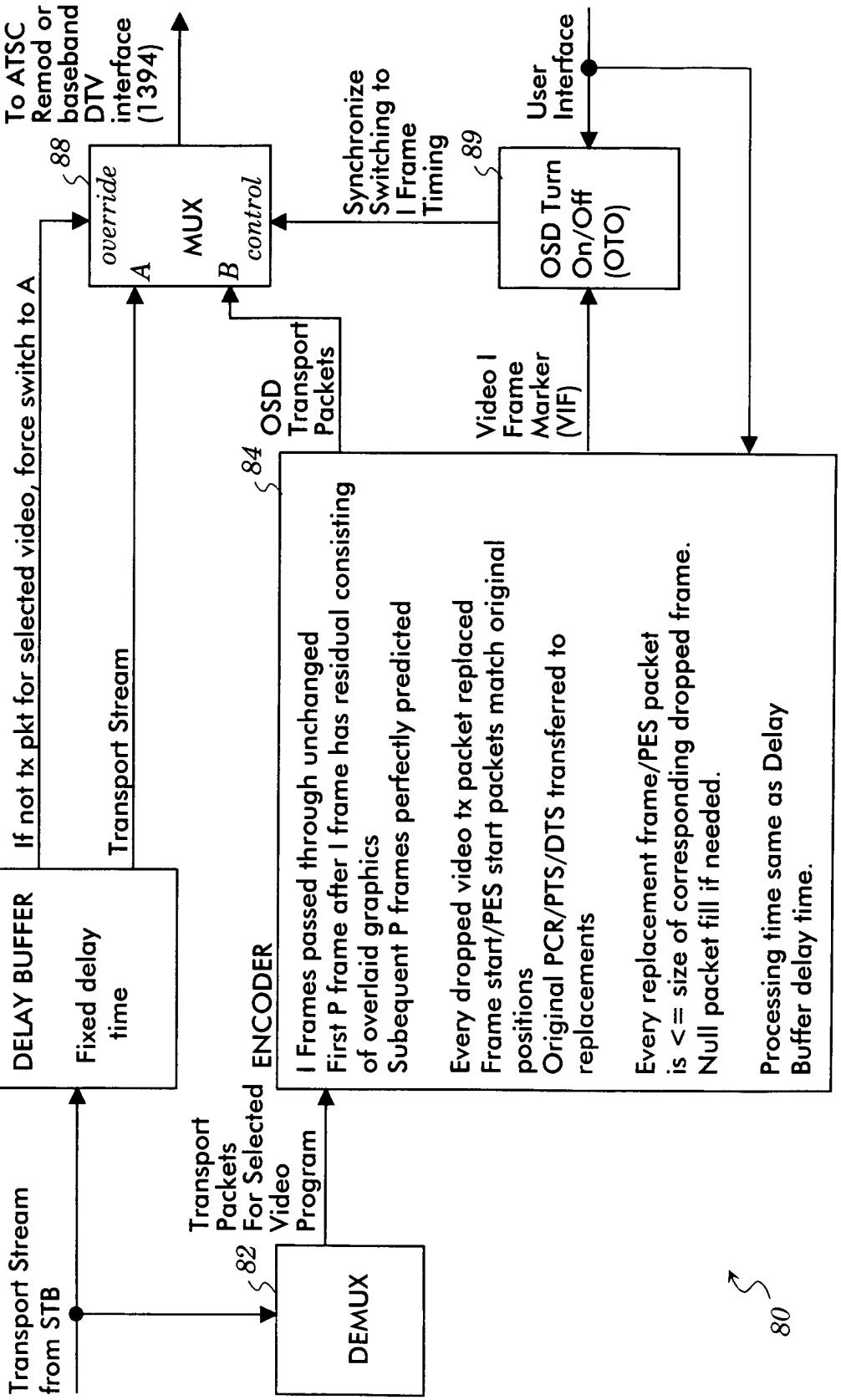
Transport Stream from STB
DEMUX
82
Transport Packets For Selected Video Program
ENCODER
84
I Frames passed through unchanged
First P frame after I frame has residual consisting of overlaid graphics
Subequent P frames perfectly predicted
Every dropped video tx packet replaced
Frame start/PES start packets match original positions
Original PCR/PTS/DTS transferred to replacements
Every replacement frame/PES packet is <= size of corresponding dropped frame.
Null packet fill if needed.
Processing time same as Delay
Buffer delay time.
OSD Transport Packets
Video I Frame Marker (VIF)
DELAY BUFFER
Fixed delay time
86
If not tx pkt for selected video, force switch to A
Transport Stream
MUX
override
A
B
control
88
To ATSC Remod or baseband DTV interface (1394)
Synchronize Switching to I Frame Timing
OSD Turn On/Off (OTO)
89
User Interface
80

Fig. 6

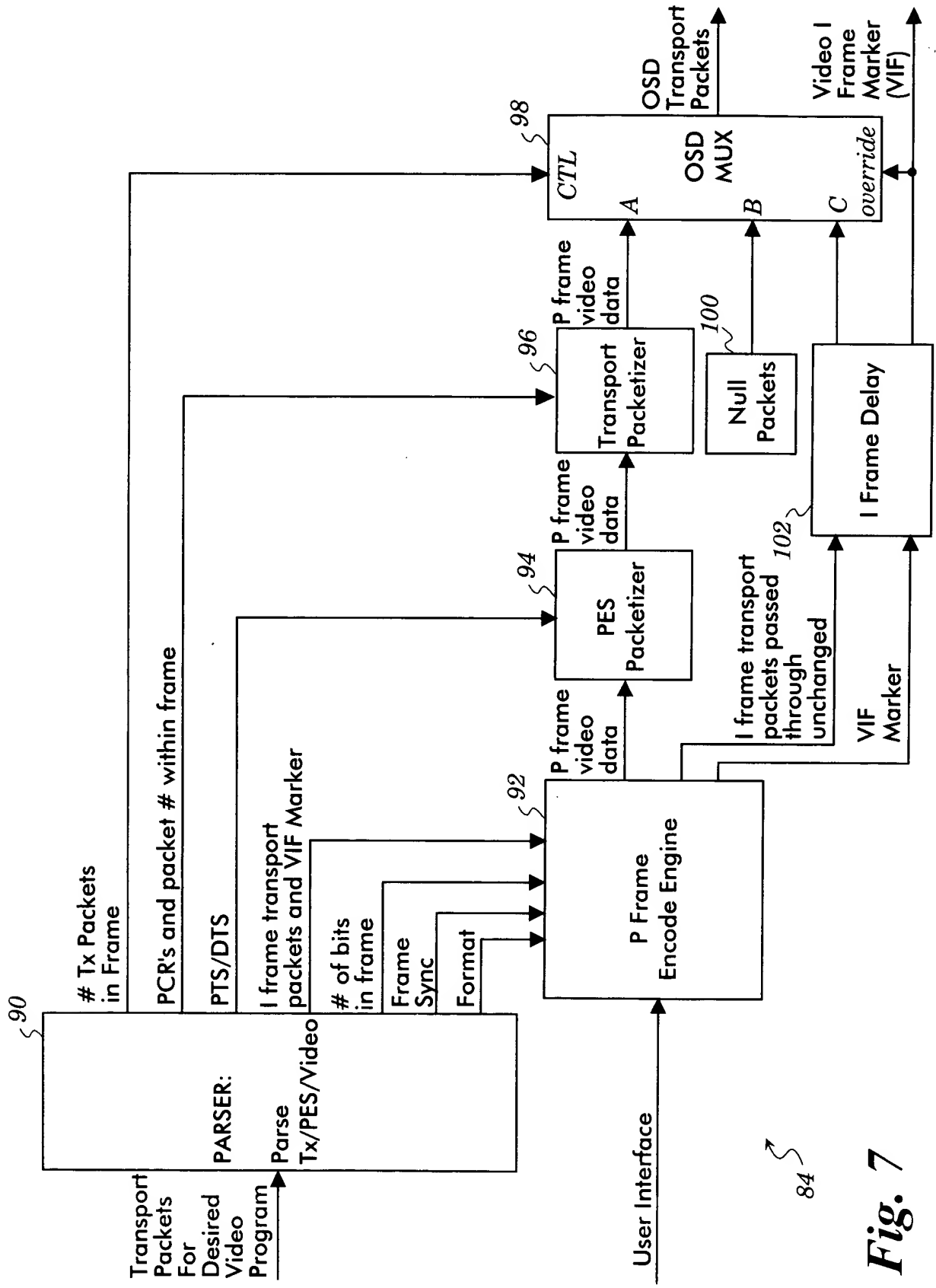
Transport Packets For Desired Video Program
User Interface
84
90
PARSER:
Parse Tx/PES/Video
Tx Packets in Frame
PCR's and packet # within frame
PTS/DTS
I frame transport packets and VIF Marker
# of bits in frame
Frame Sync
Format
92
P Frame Encode Engine
P frame video data
94
PES Packetizer
P frame video data
96
Transport Packetizer
P frame video data
100
Null Packets
102
I Frame Delay
I frame transport packets passed through unchanged
VIF Marker
98
CTL
OSD MUX
A
B
C
override
OSD Transport Packets
Video I Frame Marker (VIF)

Fig. 7

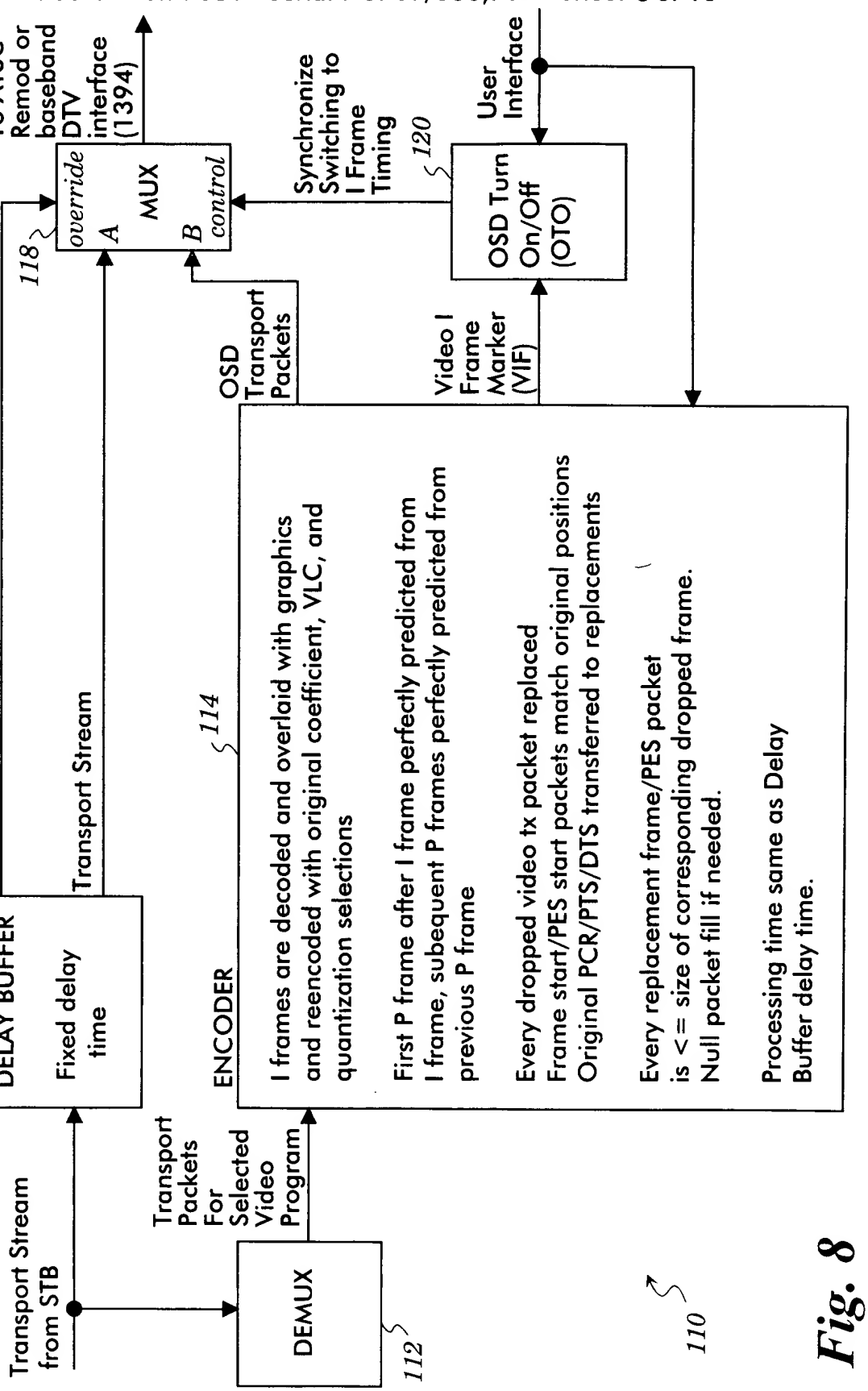
Transport Stream from STB
DEMUX
112
Transport Packets For Selected Video Program
ENCODER
114
I frames are decoded and overlaid with graphics and reencoded with original coefficient, VLC, and quantization selections
First P frame after I frame perfectly predicted from I frame, subequent P frames perfectly predicted from previous P frame
Every dropped video tx packet replaced Frame start/PES start packets match original positions Original PCR/PTS/DTS transferred to replacements
Every replacement frame/PES packet is <= size of corresponding dropped frame. Null packet fill if needed.
Processing time same as Delay Buffer delay time.
OSD Transport Packets
Video I Frame Marker (VIF)
OSD Turn On/Off (OTO)
120
User Interface
Synchronize Switching to I Frame Timing
MUX
override
A
B
control
118
To ATSC Remod or baseband DTV interface (1394)
DELAY BUFFER
Fixed delay time
116
If not tx pkt for selected video, force switch to A
Transport Stream
110

Fig. 8

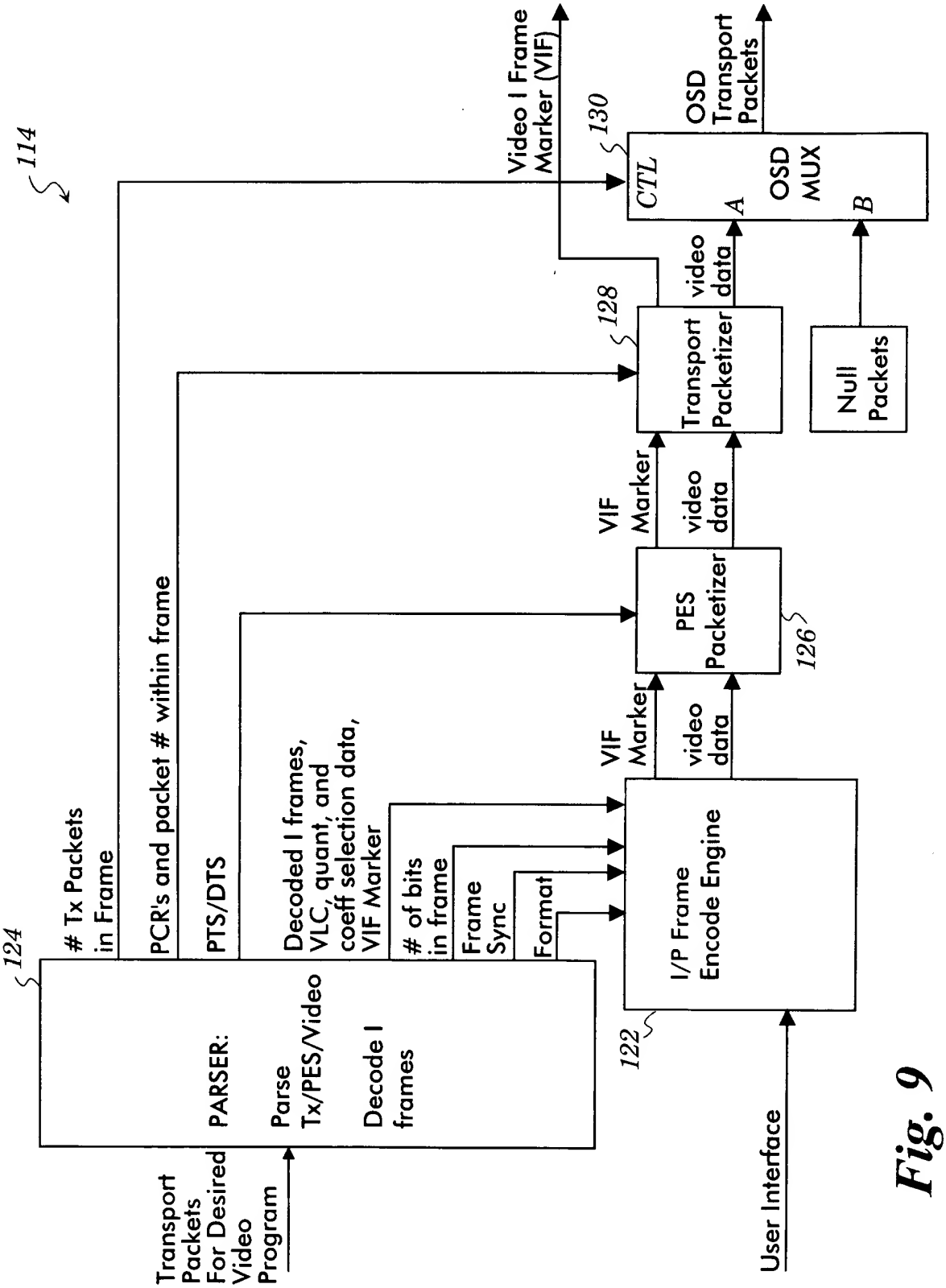
114
124
PARSER:
Parse Tx/PES/Video
Decode I frames
Transport Packets For Desired Video Program
Tx Packets in Frame
PCR's and packet # within frame
PTS/DTS
Decoded I frames, VLC, quant, and coeff selection data, VIF Marker
# of bits in frame
Frame Sync
Format
122
I/P Frame Encode Engine
User Interface
VIF Marker
video data
126
PES Packetizer
VIF Marker
video data
128
Transport Packetizer
video data
Null Packets
130
CTL
OSD MUX
A
B
Video I Frame Marker (VIF)
OSD Transport Packets

Fig. 9

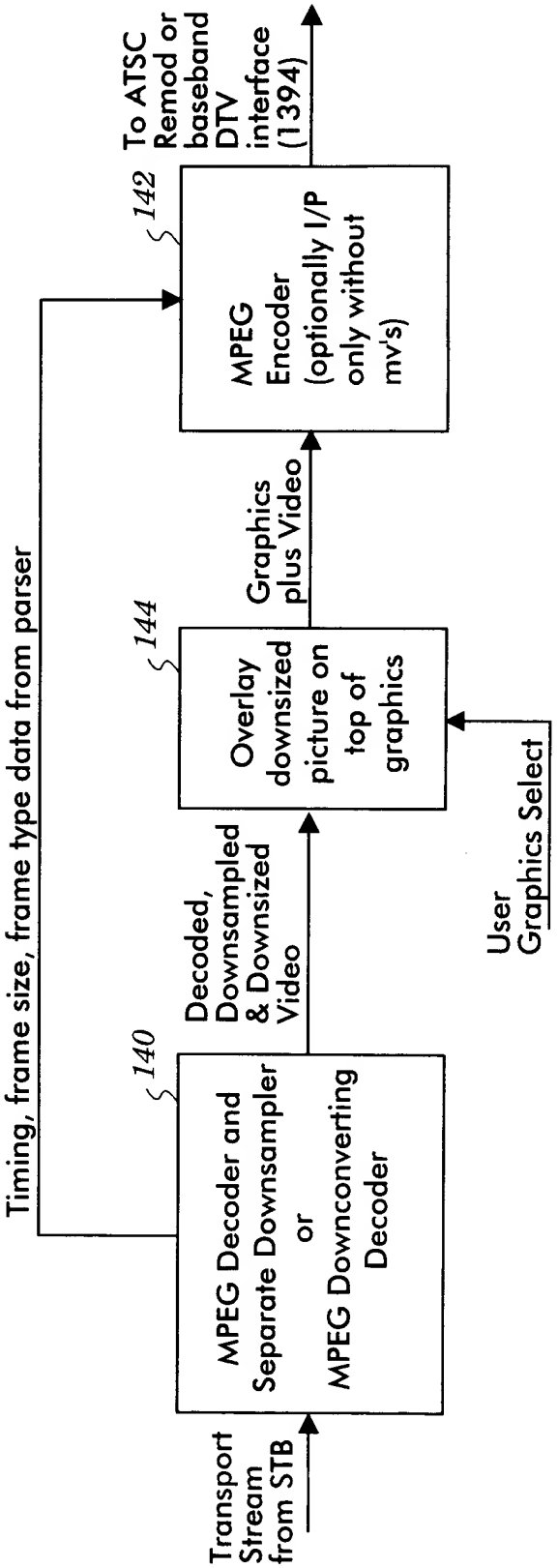
Transport Stream from STB
MPEG Decoder and Separate Downsampler or MPEG Downconverting Decoder
140
Decoded, Downsampled & Downsized Video
Timing, frame size, frame type data from parser
User Graphics Select
Overlay downsized picture on top of graphics
144
Graphics plus Video
MPEG Encoder (optionally I/P only without mv's)
142
To ATSC Remod or baseband DTV interface (1394)

Fig. 10